ARI Newsletter

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Measuring Unit Proficiency in Using Digital Systems

Part of the U.S. Army's effort to modernize its forces to meet future combat requirements is its employment of emerging information technology to enhance combat effectiveness. Selected units are being equipped with networked computer systems designed to quickly distribute combat-related information and enhance command and control. The platform level Force XXI Battle Command Brigade and Below (FBCB2) system is used to connect individual platforms (e.g., tanks) with each other and with the Army Battle Command Systems (ABCS) digital systems in the tactical operations center. These digital systems are intended to enhance the situation awareness (SA) of both leaders and soldiers, as well as increasing the unit's operating tempo (OPTEMPO). Visual displays show positions of friendly units in relation to terrain and threats, helping leaders and soldiers to envision the battlespace. Information such as orders, plans, and battlefield graphics can be transmitted electronically and shared by the entire unit. Such

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From the Acting Director

Dr. Edgar M. Johnson retired in February 2002 as the Director of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) after more than 30 years of federal service. On the occasion of his retirement he was awarded the Exceptional Civilian Service Medal for his preeminent leadership in the Army's soldier-oriented science and technology mission and for his achievements in support of Army Training, Leader Development, and Soldier issues. He was instrumental in technology push and in expanding scientific frontiers. His touch was felt in much of the work described in this Newsletter.

We will miss Dr. Johnson's technical, professional, and leadership skills. With the extraordinary talents and dedication of ARI's scientists, survey statisticians and administrative staff, ARI expects to play an even more vital role in helping the Army to meet the personnel performance and training challenges of the Objective Force.

"The soldier is the centerpiece of our formation." — Shinseki

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Such sharing of information, combined with improved SA, has the potential to reduce the time required to plan and coordinate actions, increasing the tempo of operations. The realized benefits of digitization depend upon unit proficiency operating these systems and using the information they provide. The Measure Digital project is concerned with measuring unit proficiency in using digital systems.

Digital systems, as well as the tactics, techniques and procedures (TTPs) for their use, are evolving and will continue to evolve. This evolutionary process needs to be guided by measures of digital proficiency that transcend software versions of systems. Digitization has the effect of overwhelming trainers for unit collective training exercises with observation requirements (See "Exercise Control and Feedback Challenges for the Digitized Battlefield" in the Fall 1999 ARI Newsletter). Therefore, an important goal of the Measure Digital project is to define targets for digital proficiency measurement that most warrant the attention of trainers and that transcend specific software versions.

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Four Approaches to Identifying Measurement Targets

ARI employed four approaches to define digital proficiency measurement targets that can apply across time and help reduce trainer workloads. The first approach was to identify persistent problems in the performance of analog units likely to be addressed by the effective use of digital systems. The second approach was to focus on what leaders say about how the way they train and fight changes as they gain experience using digital systems. The third approach was to describe differences in digital tasks and skills found between battalion and brigade, under the assumption that focusing on brigade-unique digital tasks and skills is crucial to brigade training. The fourth approach was to describe what units should do to gain two of the "advertised" benefits of digitization: fratricide reductions and greater unit control over how and when contact is made with the enemy.

Targeting Persistent Problems in the Performance of Analog Units

Observer/Controllers (OCs) at the U.S. Army's maneuver combat training centers (CTCs) focus on aspects of unit performance that appear to contribute substantially to mission outcomes. The U.S. Army's Center for Army Lessons Learned (CALL) subsequently reviews the feedback given to units rotating to the maneuver CTCs to describe trends over time. ARI identified the problems in unit performance occurring most frequently under the CALL "needs emphasis" trends and focused on the subset of these problems likely to be addressed by the effective use of digital systems. ARI described the mechanisms whereby effective use of digital systems could address each of roughly two hundred identified problems. For example, digitization would be expected to address the problem "smoke plans are rarely made and coordination of the targeting process between fire support and maneuver does not occur" by multiple mechanisms. Increased awareness of the location of enemy forces, combined with the use of terrain analysis tools, makes it possible to predict where and when moving friendly forces are likely to be seen by the enemy. This allows the fire support element to plan to support the maneuver unit with smoke at a time and location likely to offer the greatest benefit. Since digital systems allow the

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ARI employs four approaches to define digital proficiency measurement targets that are applicable across time and capable of reducing trainer workloads.

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precise trigger of unit location rather than the less precise trigger of time to initiate the smoke mission. In this way, if the pace of movement of the maneuver unit is faster or slower than expected, the unit can avoid a situation where smoke is provided too late or too soon.

ARI then looked for recurring themes in terms of problems and digital mechanisms for addressing problems. All but a few of roughly two hundred problems fell within one or more of the eight categories shown in Table 1.

Finally, ARI described the skills needed in applying the mechanisms. For example, the capability to use digital SA displays to maintain an awareness of the location of a unit relative to threat situations is a skill that helps address many persistent problems in unit performance.

Table 1. General Problems in Unit Performance and Digitization Potential

General Problem	Digitization Potential.
Lack of awareness of some aspect of the tactical (friendly or threat) situation	Increased situation awareness (SA)
Lack of synchronization (within or across Battlefield Operating Systems [BOS]) in terms of time, space, or activities	Increased SA (wargaming tools) and increased operating tempo (OPTEMPO) (sharing of evolving plan)
Lack of awareness of some aspect of the plan or lack of input to the plan by a BOS or subunit	Increased OPTEMPO (sharing of evolving plan)
Details missing from plan	Increased OPTEMPO (sharing of evolving plan)
Lack of understanding of the tactical situation	Increased SA (wargaming tools)
Key elements of the plan produced late	Increased SA and increased OPTEMO (sharing of evolving plan)
Inadequate mission preparation	Increased SA and increased OPTEMO (sharing of evolving plan)
Unit is highly vulnerable or lacks lethality	Increased SA (wargaming tools)

This approach provided four groups of digital proficiency measurement targets linked to problems in unit performance that O/Cs have observed repeatedly across the years. One can target the persistent problems in unit performance, the eight problem categories, mechanisms whereby digital systems can help address problems, and/or the candidate digital skills.

Targeting Reported Changes in Unit Behavior

Leaders and soldiers within a digitized unit at the 4th Infantry Division were interviewed to find out how they believe their behaviors have changed or should change as a function of experience using digital systems. The reported changes included both "how to fight" and "how to train."

Many of the reported changes in the way units fight are relevant to performance problems identified in the analysis of CTC data. For example, digital leaders reported that the commander's Priority Intelligence Requirements (PIR) became more specific and the commander updated the PIR rather than staying with the same PIR throughout the mission. This reported change is directly relevant to one of the high frequency problems identified in the analysis of CTC data, "intelligence requirements are not updated as the situation changes."

Other changes are concerned with what the Army and specific units need to do to support the acquisition of digital skills and the employment of digital systems. For example, leaders have found it is crucial to press their units to make sure individual systems are both operational and properly connected to each other via networks. In one example, a battalion commander found various ways to reward subordinate units with the highest connectivity rates and had software developed to help measure such rates. Knowing what a unit does to make sure a high connectivity rate is main-

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tained is an important measure of how far that unit has progressed down the digitization road.

Targeting Digital Tasks and Skills Emerging at Brigade Level

The third approach described differences in digital tasks and skills between battalion and brigade level. This approach assumes that for brigade level exercises, one would want to give added emphasis to those tasks and skills which discriminate between brigade and battalion digital operations.

Senior, experienced digital leaders and staff members were asked how they thought digital skills differed between battalion and brigade level. In addition, contractors with experience supporting the training of digital units and/or as leaders of a digital unit were asked to describe observed or desired digital activities at battalion versus brigade level.

An example of an important finding concerns Battlefield Operating System (BOS) synchronization functions. In the digital environment, many BOS synchronization functions that used to be performed at battalion level have been shifted to brigade level. In looking at the roles of ABCS operators, one would expect those at brigade level to spend more of their time communicating information to other BOSs. One would also expect the ABCS operators to be more astute regarding BOS integration issues than their counterparts at battalion level.

Targeting Activities that Insure the Advertised Benefits of Digitization

The fourth approach described what units should do to gain two of the advertised benefits of digitization, reducing the number of fratricides and gaining greater control over when and how contact is made with the enemy. These benefits are not realized until units have mastered a number of TTPs. Measuring the extent to which a unit applies these TTPs should be a high priority.

Contractors with experience supporting the training of digital units or leading such units were asked to describe what units should do in order to use digital systems in a manner that reduces fratricides and increases unit control over enemy contact variables. One example of how units can use digitization to help reduce fratricides is in reference to indirect fire fratricides. The Automated Field Artillery Tactical Data System (AFATDS) can be used to establish weapons effects buffer zones around units. These weapon buffer distances ensure that the effects area for each weapon system does not violate the control or boundary/zone.

Digital systems can also help leaders and soldiers better control contact with the enemy. For example, the FBCB2 system provides users with navigational tools and terrain analysis tools. Used in conjunction, these tools can help leaders plan routes of travel through visual dead zones so as to avoid enemy observation.

Additional Approaches Being used to Target Digital Proficiency Measurement Objectives

Ongoing work is concerned with selecting among the digital measurement targets identified using the four approaches described above and otherwise developing strategies for reducing the observation workload of trainers for digitized units. It is expected that certain digital tasks will be easy to perform and require little training, while others will require substantial training. In general the time of trainers is better spent making observations relevant to those skills that are more difficult to acquire, so ARI will examine the difficulty level associated with various digital tasks and skills.

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Infantry Squad Radio Communications and Situation Awareness

Enhance the situation awareness of dismounted infantrymen.

Currently, a dismounted infantry squad has only one radio. The squad leader uses it for communications with the platoon leader. Communications within the squad occur using normal vocalizations or non-verbal methods (e.g., arm and hand signals). However, the squad leader and other squad members may need to share information when normal vocalizations are not appropriate (e.g., they could be heard by the threat force) or when non-verbal communications are insufficient or not possible. These considerations alone created interest in equipping all infantrymen with a radio. Some proponents of squad radios argue further that their use would enhance the situation awareness (SA) of dismounted infantrymen. For this ARI project, we focused on analyzing data we collected on the frequency and content of radio communications during a recent experiment and on reanalyzing some SA data collected by others.

Experimental Context

Five U.S. Army Ranger squads participated in the experiment at the McKenna Military Operations in Urban Terrain (MOUT) Site, Fort Benning, GA. Each squad conducted defensive and offensive missions shaped by vignettes that were scripted and of short duration. The scripted vignettes included platoon radio transmissions about friendly and threat conditions sent by the platoon leader to the squad leader. The squad leader had to use both the platoon radio and the squad radio. He was encouraged to use the squad radio as his primary means of communicating with squad members and to retransmit to the squad members the scripted information provided by the platoon leader. While the squad members always received (i.e., heard) all messages transmitted on the squad radio, they were not necessarily granted permission to transmit radio messages. The following four squad radio procedures were used:

- no squad member could transmit;
- only the leaders of the two rifle teams could transmit, but only to the squad leader;
- all four members of each rifle team could transmit to anyone else in their team or to the squad leader; and
- all squad members could transmit to any other squad member on either team or to the squad leader.

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Another approach to identifying targets for digital measurement activities is to ask leaders and soldiers within digitized units about the adequacy of the feedback they receive regarding the operation and use of digital systems. Digitization has the potential to provide units with feedback in real time that they formerly received after an exercise and only when trainers prepared feedback displays. To help reduce the trainer's workload in training digitized units, the Army needs to make sure that measurement efforts are focused on feedback gaps rather than creating redundant feedback.

A very useful tool in reducing measurement workloads for training digitized units would be the capability to define levels of unit digital proficiency. Given a situation where a unit is at a particular level of digital proficiency, trainers would focus on specific aspects of behavior.

For additional information, please contact ARI Simulator Systems Research Unit, DSN 970-3980 or commercial (407) 384-3980.

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Following each trial, the squad leader and squad members were administered a SA test to assess their knowledge about mission-critical events. The scripted information provided by the platoon leader was the basis for most knowledge items on the SA test. The base SA measure of each infantryman was the percentage of correct answers he gave on each SA test.

Data Collected and Analyzed by ARI

We developed a data collection form that permitted real-time tabulation of messages transmitted on both the platoon and squad radios. Messages were partitioned according to whether they provided input to others or requested input from them. Then, messages were further separated into those containing information about friendly or threat conditions. Four alternate measures of SA were derived from the base measure of SA: the mean SA of the squad leader and of the squad members, as well as mean squad-level SA scores dependent on information provided over the radio from the platoon leader (top-down SA) and that which could have been determined directly from squad leader and squad member observations in the combat environment (bottom-up SA).

Results for Squad Leader Communications

Our analysis showed that on a typical 13-minute trial, the squad leader received or sent about 66 transmissions on the platoon radio and about 38 on the squad radio. The frequency of transmissions initiated by the squad leader on either radio did not vary over the four sets of squad radio procedures. The information he provided to the squad members was largely determined by the requirement that he retransmit scripted information from the platoon leader. In contrast, there were no preconditions for what information the squad leader could request from the squad members. Our analyses showed that on defensive mission trials, the squad leader provided information more frequently about friendly than threat conditions but that he requested information more frequently about threat than friendly conditions. There was no effect of information type on offensive mission trials. As will be described shortly, differences in the types of information communicated have implications for interpreting the SA of infantrymen during the execution of a mission.

"As radio procedures permitted more squad members to communicate with more other squad members the squad level SA scores decreased while the squad member and top-down SA scores remained relatively low and constant."

Results for Squad Member Communications

The analyses of communications by the squad members were restricted to the three procedures that permitted them to transmit messages on the squad radio. About 83 percent of these communications was concerned with the squad members providing information about friendly and threat conditions. The data in Figure 1 show that the frequency of communications that provide information increased as radio procedures permitted more squad members to transmit to more other squad members. Communications about threat conditions were more frequent during defensive than offensive missions for all sets of radio procedures. In

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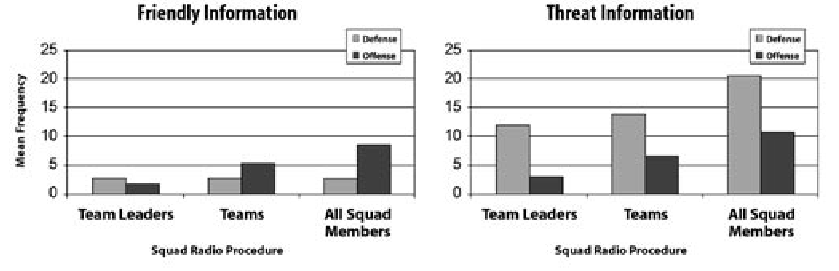
Figure 1:



Infantry Squad Radio Communications and Situation Awareness

contrast, commucnications about friendly conditions were more frequent during offensive than defensive missions, but only if all squad members could communicate with all other squad members. They were equally infrequent across mission types if communications were restricted to the team leaders or to within teams.

Results for Alternative SA Measures

The data in Table 1 show that all four SA measures tended to be highest for the squad radio procedure that permitted no squad member to transmit. As radio procedures permitted more squad members to communicate with more other squad members the squad leader SA scores decreased while the squad member and top-down SA scores remained relatively low and constant. In contrast, the bottom-up SA scores were equal for procedures that permitted no squad member or all squad members to transmit and significantly lower when squad radio communications were permitted only for team leaders or within teams.

What do these results tell us?

The results show that the use of squad radios may cause large increases in the amount of information to be processed by both the squad leader and the squad members. The results also show that the type of mission being executed and the type of information being transmitted affect squad radio communications. While most of the scripted information flowing downward from the platoon leader though the squad leader to the squad members was concerned with friendly conditions, that flowing upward was concerned with threat conditions. The results suggest that the immediate needs of both the squad leader and squad members may be better satisfied by the upward flow of information from the frontline infantryman than the downward flow of information from a higher echelon. As the amount of information to be processed increases, the infantrymen may attend more to the former and less to the latter source of information. This proposed shift in attention from top-down to bottom-up sources of information as more squad members transmit to more other squad members could explain the different trends found in the SA measures as a function of squad radio procedures.

The Infantry Forces Research Unit of ARI is currently extending the scope and depth of these results. We are assessing the amount, types, and directions of information flow in other types of dismounted infantry missions and developing communication-based measures of SA.

For additional information, please contact ARI - Infantry Forces Research Unit, DSN 835-2207 or Commercial (706) 545-2207.

Table 1. Mean Values for each Measure of SA

SA Measure	Squad Radio Procedure			
	No Squad Member	Team Leaders	Teams	All Squad Members
Squad Leader	72	68	61	42
Squad Member	46	37	35	35
Top - Down	48	48	44	37
Bottom - Up	54	34	31	40

Internet Access and PC Capabilities for the Army

Background.

As the U.S. Army places greater emphasis on knowledge-based activities, access to the Internet as well as having and knowing how to operate personal computers (PCs) are essential. For example, the trend in industry and the military is to use distance learning to achieve educational needs and training objectives. The Army University Access Online (AUAO), The Army Distance Learning Program (TADLP), Distributive Training Technology Project (DTTP), and the DoD-endorsed Advanced Distributed Learning Initiative make the classroom available at anytime from anywhere throughout the world.

Source.

The Army Personnel Survey Office at the U.S. Army Research Institute for the Behavioral and Social Sciences conducts the Sample Survey of Military Personnel (SSMP) semi-annually in the spring and fall on behalf of the Army Deputy Chief of Staff, G-1. The information provided below is based on responses to the Fall 2000 SSMP.

Internet Access. Who has Access?

In the fall of 2000, almost all officers (98.7%) and five-sixths (84.6%) of enlisted personnel have access to the Internet (A PC is not needed to access the Internet.) (Figure 1). (The Spring 2001 SSMP reported similar levels of access.)

Since the spring of 1999, the percentage of soldiers with Internet access increased from 87.6% for officers and from 60.6% for enlisted personnel.

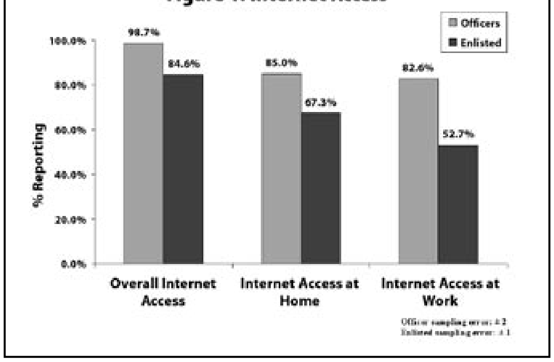
Home and Work Access.

Of those officers who have access to the Internet, five-sixths have access at home (85.0%) and at work (82.6%). Of enlisted personnel who have access to the Internet, two-thirds (67.3%) have access at home and one-half (52.7%) have access at work. (Figure 1).

Personal Web Sites.

About one-tenth (11.4%) of officers and about one-sixth (16.4%) of enlisted personnel have their own, personal web sites.

Figure 1: Internet Access



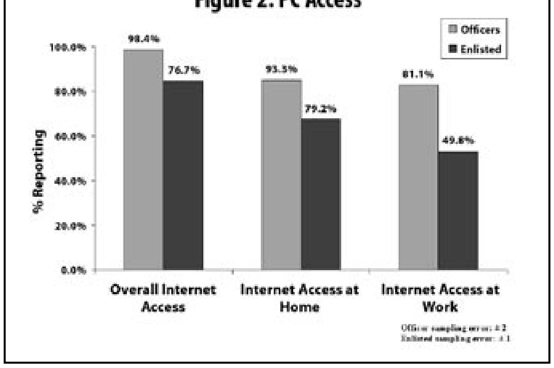
PC Access. Who has Access?

Almost all officers (98.4%) and over three-fourths (76.7%) of enlisted personnel have access to a PC. (Figure 2).

Home and Work Access.

Of those officers who have access to a PC, nine-tenths (93.3%) have access at home and four-fifths (81.1%) have access at work. Of enlisted personnel with access to a PC, four-fifths (79.2%) have access at home and one-half (49.8%) have access at work. (Figure 2).

Figure 2: PC Access



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The Sample Survey of Military Personnel is a biannualsurvey that assesses Internet and PC use among enlisted men.

"There are some statistically significant differences in reported capabilities of home and work computers among ank groups, gender, race/ethnicity, and type of unit."

Internet Access and PC Capabilities for the Army

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Family Member PC Use at Home.
Of those who have access to a PC in their household/personal quarters, almost all (94.4%) officers and five-sixths (83.0%) of enlisted personnel use the PC themselves. Nine-tenths (89.9%) of these officers' spouses and three-fourths (76.9%) of enlisted personnel's spouses also use the PC available at their home/personal quarters. Almost three-fourths (72.5%) of these officers' children and almost three-fifths (55.9%) of enlisted personnel's children also use the PC.

PC Capabilities, Home and Work.
PCs at home for both officers and enlisted personnel tended to be more advanced than PCs at work in terms of processor speed, hard drive capacity, RAM, CD-ROM drive speed, sound card with speakers, text/image scanner, and modem. For example one-fourth (25.0%) of the officers and one-third (32.3%) of enlisted personnel have PCs with more than a 500 MHz processor at home while only one-seventh (15.3%) of the officers and one-sixth (17.0%) of enlisted personnel have PCs with more than a 500 MHz processor at work. One-fourth (24.6%) of the officers and three-tenths (30.2%) of enlisted personnel have a PC at home with more than a 12 GB hard drive while one-eighth (13.2%) of the officers and one-seventh (14.6%) of enlisted personnel have a PC at work with more than a 12 GB hard drive.

Statistically Significant Differences Among Analysis Groups.
There are some statistically significant differences in reported capabilities of home and work computers among rank groups, gender, race/ethnicity, and type of unit. For example one-fifth (20.6%) of field grade officers and one-eighth (12.2%) of company grade officers have a PC at work with more than a 500 MHz processor. One-fifth (19.2%) of officers assigned to TDA units but only one-tenth (10.3%) of officers assigned to combat arms (CA) units have a PC at work with more than a 500 MHz processor. Additionally, one-fifth of Hispanic (22.3%) and Black (20.7%) enlisted personnel compared with one-eighth of White (13.0%) enlisted personnel have a PC at work with more than a 500 MHz processor.

Additional Information.
An electronic copy of the full report on the Fall 2000 SSMP "Internet Access and PC Capabilities" analysis is available by sending a request to the Army Personnel Survey Office at the U.S. Army Research Institute.

For additional information, please contact ARI-US Army Personnel Survey Office, DSN 767-7801 or Commercial (703) 617-7801.

The SSMP collects information on a wide range of issues important to the Active component Army, soldiers, and their dependent family members. Army offices, agencies, and commands submit questions on topics to be addressed by the SSMP. The results of the survey are used by Army policymakers to assess soldier and family well-being, develop plans, assess policies, and evaluate program operations and outcomes.

The population for SSMP consists of all permanent party, Active component Army personnel (commissioned officers, warrant officers, and enlisted personnel [excluding all PV1 soldiers and PV2 soldiers in Europe and Korea]). Samples of about 10% of officers and 2-3% of enlisted personnel are randomly drawn, using the final 1 or 2 digits of soldiers' social security numbers. The Fall 2000 SSMP was conducted from about 15 October to 15 December. Usable responses were received from 4,055 officers and 5,473 enlisted personnel. Data are weighted up to official Army strength at each rank level at the time the survey was conducted.

Online Learning of Complex Skills

The Army, as do many large training organizations, envisions that future training will rely more on Web-based, online approaches than on paper-based methods for geographically dispersed learners. In addition, the Army has a keen interest in the establishment of sound designs for the online training of complex skills along with leadership adaptability and flexibility. This particularly is important with the recognized change in the threat environment and the calls to transform military training, e.g., 2001 Quadrennial Defense Review. Skills that should benefit from online training include tactical thinking, interpersonal intuitions, and problem solving, often in collaboration with others. Most distributed learning today is asynchronous where students learn at anytime but not usually with any real-time contact with other learners or the instructor. In contrast, the two research examples reported here examined the nature of synchronous online communications with live interactions or with interactions involving software "agents." In general, the tasks required groups of Army learners to hone complex skills. In the first example, learners engaged in two tacit knowledge exercises about personal skills and tactical knowledge. In the second, Armor officers engaged in collaborative problem-solving tasks. The purpose in synchronous environments was (1) to assess the effectiveness of software "agents" replacing certain instructor functions and (2) to measure the degree and nature of the interactions during collaborative learning over networks.

"In developing an automated environment where the learning of tacit knowledge could be accelerated, ARI created a synchronous discussion system called the Knowledge Post."

Two research examples examine the nature of synchronous online communications with live interactions.

Leadership Tacit Knowledge - Online

Over the past decade, ARI has developed several powerful measures of the practical knowledge a leader learns during years of growing expertise in the Army (Hedlund, Sternberg and Psotka, 2000). This intuitive knowledge largely lies within the scope of doctrine and standard operating procedures but usually is too rich and detailed for explicit descriptions in Army FMs and TMs. Yet, this intuitive, or tacit, knowledge is extremely valuable, learned slowly and with great difficulty. In developing an automated environment where the learning of tacit knowledge could be accelerated, ARI created a synchronous discussion system called the Knowledge Post. One of the powerful features of this Knowledge Post is an intelligent agent that assesses the quality of a participant's text contribution in terms of its relevance to the central topic. It provides advice about other related contributions, and may provide additional details to help improve thinking (Landauer and Psotka, 2000). The Knowledge Post has potential to improve all aspects of growing tacit knowledge. Therefore, ARI assessed its value over paper-and-pencil answers to complex scenarios involving both tactical and interpersonal issues.

Sixteen groups of officers at four Army installations participated in the experiment. Data were collected in small groups of 5 to 15 officers, where group members were all of the same rank. A total of 125 officers participated. Each group convened for a three-hour period in an ordinary classroom for the paper and pencil exercises, or a distance learning classroom with web browsers available on each desktop.

The task required officers to respond in writing to a scenario regarding the resolution of a situation in a tactical scenario. The scenario was based on a PowerPoint briefing that gave a detailed description of the tactical situation, opposing forces, and commander's intent in a fictitious combat zone Centralia that looked a lot like Kansas. In the scenario the officer must assume that she or he is a member of the Command group 2BDE/55th ID/X Corps/ 33 US Army. A sample scenario follows.

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Online Learning of Complex Skills

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> You have been briefed about the current situation involving the US, Dakota, Nebraska, and Centralia. You have just held against the Dakotan offense, and been given new mission and intent, with a refueling mission to AA ROSE. Elements of your FSB are moving forward to establish a refueling site for units moving into their defensive positions. Civilians from a nearby refugee camp have blocked the stopped convoy in route. What should you do to resolve this situation?

Again, responses were open-ended essays. Retired military, civilians with more that 20 years of Army experience, and the automatic intelligent agent built into the Knowledge Post assessed the resulting essays and responses. Their assessments (Figure 1) were that solutions proposed by participants in the Knowledge Post resulted in much better resolution of the tactical situation than in paper-and-pencil solutions. Also, there was more thorough and complete discussion of the tacit knowledge that supported the solutions online than in face-to-face discussion. On the paper and pencil task, senior officers (LTCs) performed much better than the CPTs and MAJs. However, this difference was overcome in the contributions provided in Knowledge Post, where officers could critique each other and share their experiences and knowledge. When able to reflect on their answers and share their tacit knowledge, lower ranking officers' answers were indistinguishable from the senior officers'. Reflection is particularly important in this environment as a supported critical thinking skill that promotes adaptability and flexibility in officers' thinking.

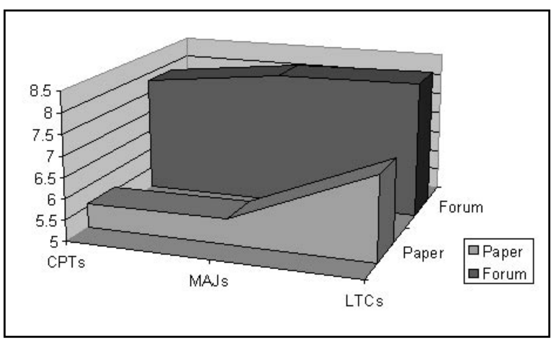

Figure 1. Superior performance by officers on a tactical tacit knowledge scenario within the on-line discussion Knowledge Post.

We found a similar result for interpersonal scenarios such as the following sample:

> You are a company commander, and your battalion commander is the type of person who seems always to "shoot the messenger"--he does not like to be surprised by bad news, and he tends to take his anger out on the person who brought him the bad news. You want to build a positive, professional relationship with your battalion commander. What should you do?

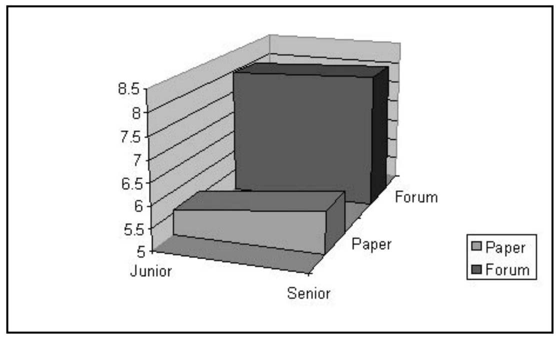

Figure 2. Superior performance by both junior and senior officers within the online Knowledge Post discussion system.

Again, Rresponses were open-ended essays. Using four variations of the scenario, officers demonstrated a profound superiority in the essays written within the Knowledge Post (Figure 2). Both junior (LTs, CPTs) and senior (MAJs, LTCs) officers were superior in the tacit knowledge tasks that assess interpersonal leadership skills. How much of this difference is due to the effect of the automated intelligent assistant remains to be explored in further research.

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Online Learning of Complex Skills

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Armor Problem Solving - Online

In this effort, ARI examined the use of chat environments over longer periods of time, to see not only how they may be effective for learning and problem solving, but also how they support social exchanges. The problem-solving activities derive from a course conducted by the U.S. Armor School, Fort Knox, called the "Armor Captain's Career Course." As designed by the Armor School, the course has three phases (Wardell and Paschetto, 2001). Research focused on the second phase that centers around a synchronous, Web-based learning environment termed the "Virtual Tactical Operations Center" (VTOC). In this phase, soldiers work collaboratively on problem-solving tasks requiring higher-order thinking skills for mission analyses, decision making, traversing map terrains, and collaborative document writing and review. Since the participants realize that they will work together online over an extended period, prior to meeting face-to-face for the first time, it was anticipated that significant social interactions would occur in this collaborative environment.

Most research supports the notion that online groups are likely to spend the majority of their interactions (i.e., communications between participants) focusing on the task rather than social interactions. While the results are mixed regarding the impact of technology on social exchanges, it is clear that important social exchanges occur in some online environments. Also, one of the recurring criticisms from online learners is that the technology is problematic. At times people struggle much more with the tools than the task, subtracting from potential learning activities. With experience, it is likely that interaction regarding technology would decline. Therefore, we expected that interactions on the mechanics of operating the VTOC would follow a receding pattern. As expressed through online chats, then, our interest was in the relative pattern of on-task, social, and mechanical interactions.

Participants (n=41) were male reservists geographically dispersed across the United States in the Army National Guard. They had never met face-to-face. Text messaging data were drawn from five separate groups, which included three instructors and two technical advisors, during 12 hours on each of seven weekends over a seven-month period (the first session was via video teletraining and the remaining six were in the VTOC). The students "convened" in the online VTOC environment for sessions lasting between four and eight hours on two consecutive weekend days. In the VTOC, they solved problems collectively and generated work products. The VTOC was a visual rendition of an actual operations center. The collaborative tools available were group as well as private chat, shared whiteboard, shared bookshelf, shared text application, and 3-dimensional terrain tools.

Chat Coding. From the 6,601 coded chats, raters determined that 55% of the chats were in the on-task category, 30% were in the social, and 15% were related to the mechanics of the technology.

Changes in the relative frequency of each category were analyzed over the six-month training period. A consolidation of the data is presented in Figure 3 aggregated into three learning periods, each combining two sessions. Here, the category of task chat showed a curvilinear pattern over time, where a lower percentage of time was spent on task communication at the beginning and end of the training period compared to the middle sessions. Juxtaposed with this trend, social chat interaction was more prominent in the beginning and end of the training periods than in the middle. Not surprisingly, the category of mechanics steadily reduced over time, indicating a learning curve for the online technology by the users.

Multiple dimensions of problem-solving behavior materialized frequently in the chats. Critical thinking skills such as reflection, brainstorming, self-criticism, rhetorical argument, humor,

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Online Learning of Complex Skills

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and social engagement all arose frequently in the online environments. What's more, these problem-solving behaviors were interwoven with a steady stream of social exchange throughout the learning period. Unlike independent asynchronous instruction, in which social exchange is rare, the learners here averaged approximately 45 social chats while solving problems. This research provides evidence that expected patterns of interaction tended to hold. In addition, social interaction not only occurred often in this Army setting, but followed trends often observed in face-to-face groups. When first utilizing the VTOC, learners embedded their problem-solving activities with social exchange, not unlike what may happen in a real tactical operations center.

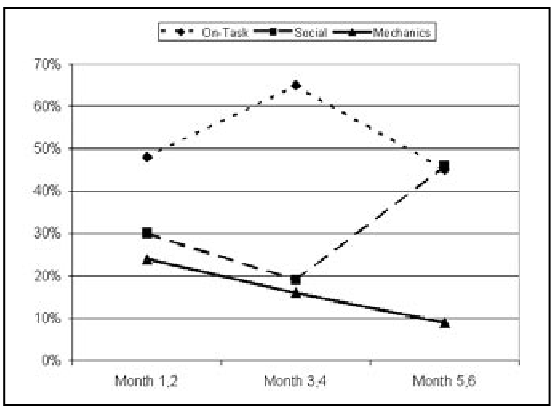

Figure 3. Social, mechanics, and on-task behaviors in the chat interactions over time.

Conclusions

The combined findings from research about synchronous online learning of Leadership Tacit Knowledge and of Armor Problem Solving suggest that social interaction may be a contributing factor to the success of training complex skills.

The Knowledge Post supports performance that is superior to results from using paper-and-pencil. In the case of online chat, no direct comparison has yet been made between task performance with and without it. However, the data do show that online chat is directed heavily at on-task topics.

So, what next? The reliance on anytime-anywhere, asynchronous delivery of instruction avoids an advantageous feature of synchronous and face-to-face instruction: real-time social interaction between learners. Organizations shifting to distance learning must consider the nature of the tasks and how performance is accomplished in the workplace before developing a complete package of asynchronous instruction. For tasks that require some degree of problem solving, particularly when performed in collaboration, the merits of online synchronous systems featuring a chat function should be considered. What is the role of the instructor in such problem solving situations? What types of chat suggestions from the instructor tend to help learning? Can this be automated to some degree? The evidence from the research on the Knowledge Post suggests that critical elements can be automated, widening the applicability of online collaborative learning to Army training.

For additional information, please contact ARI-Advanced Training Methods Research Unit, DSN 767-5648 or Commercial (703) 617-5648.

Hedlund, J., Sternberg, R. J., & Psotka, J. (2001). Tacit knowledge for military leadership: Seeking insight into the acquisition and use of practical knowledge ARI Technical Report 1105

Landauer, T. K., & Psotka, J. (2000). Simulating text understanding for educational applications with Latent Semantic: Introduction to LSA. Interactive Learning Environments, 8(1), 1-14.

Wardell, C. S. & Paschetto, G. (2001). Small group instruction in real-time over the web. Interservice Industry Training Simulation and Equipment Conference, Orlando, Florida.

Will A Microsimulator Support Introductory Helicopter Flight Training?

Micro-simulator support the tasks taught as part of core curriculum.

The Rotary Wing Aviation Research Unit (RWARU) of ARI provides research and development expertise in support of the U.S. Army Aviation Center (USAAVNC) at Fort Rucker, Alabama. Support for the Personal Computer Aviation Training Device Joint Working Group (PCATD-JWG) was described in a recent issue of the *ARI Newsletter* (Summer 2001). The acronym PCATD usually refers to an inexpensive, fixed-platform flight simulator based on microchip processing technology and commercial-off-the-shelf, consumer-oriented software (such as Microsoft Flight Simulator™). PCATDs run the gamut from desktop devices to flight simulators complete with cockpit shells and instrumentation. At the high end of this PCATD continuum the devices are often called micro-simulators.

USAAVNC received a 90-day loan of a low-cost, commercial micro-simulator. ARI was asked to perform an evaluation of this device—quickly—and report back to the JWG. The issue to be examined was: Will this micro-simulator support the tasks taught as a part of the Initial Entry Rotary Wing (IERW) core curriculum?

"Six evaluators put a finer point on it, stating that this device was not so much a 'flight simulator' as a 'procedures trainer' for the Basic and Advanced stages of Instruments."

There are three approaches for evaluating the training effectiveness of flight simulators. Utility evaluations are the easiest and quickest. Subject matter experts (SMEs) perform specific tasks or missions in the simulator and then rate the effectiveness of the simulator for training. The second category is in-simulator learning. Novices practice tasks in the simulator and thereby show learning through an improvement in performance. Typically the method is one of pre-test, practice, and then post-test. In this case practice in the simulator can be shown to produce an improvement in performance in comparison to an appropriate control group. The third category is transfer of training. Here the trainee is transferred to a new environment, such as an actual aircraft, after training in the simulator. The goal is to show that the skills learned in the simulator improve performance in the aircraft in comparison to a control group not pre-trained in the simulator. Transfer of training is an excellent method to evaluate the training effectiveness of a simulator although it is resource intensive—requiring students,

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Will It Support Introductory Helicopter Flight Training?

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Lateral view of commercial micro-simulator

instructors, aircraft, and time. Given resource constraints, ARI chose to perform a utility evaluation.

The choice of participating SMEs is particularly important. They must be a representative sample of the target audience that will actually use the device for training. In this case the target audience was flight instructors and flight students. Six current or former flight instructors, working in a training-related job at Fort Rucker, constituted the group of Experienced Aviators. Ten students, who had just completed Primary and Instrument Flight Training at Rucker, constituted the group of Student Aviators.

Seventy-one (71) flight tasks were chosen. These represent virtually the entire flying portion of the IERW curriculum. No non-flying tasks were included. Thirty-five (35) tasks were chosen from Primary Flight Training and 36 from Instrument Flight Training. Primary Training instructs the student to control the aircraft using his or her out-the-window view and ground references. Instrument Training instructs the student to control aircraft maneuvers using his or her flight and navigation instruments. Basic Instruments concentrates on flight instruments, while Advanced Instruments concentrates upon radio navigation instruments.

Desk Top Simulators of Fort Worth, Texas, under the name Rapidly Transferable Cockpit (RTC) made the micro-simulator. The RTC was a self-contained unit consisting of a seat, flight controls, visual display, speakers, processing hardware, and flight software. It was approximately 6 feet long, 3 feet wide, and 5 feet high. It used standard 110 V, 60 Hz power. The angular field of view of the display was 43 degrees horizontally by 34 degrees vertically. The CRT screen resolution was 768 pixels by 1024 lines. The RTC was capable of supporting a wide variety of PC-based flight simulator software. The evaluation was limited to Microsoft Flight Simulator 2000™. The operating system was Microsoft Windows 98™. The processor was an Intel Pentium III™ operating at a speed of 550MHz with 256MB RAM. Cyclic, collective, and pedals for flight control were made by Flight Link.

All participants were asked to rate the micro-simulator on how well it supported the training of each of the 71 tasks. The four-point rating scale was: does not support the task at all (0); supports the task slightly (1); supports the task moderately (2); or supports the task well (3). Each participant performed each flight maneuver in the micro-simulator as often as necessary before providing a rating for that task. Flight training guide standards were available for reference. All participants understood that

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Summary of Evaluation Ratings by Stage of Flight Task

Stage of Flight Training Task	Experienced Mean Median	Students Mean Median
Primary Flight Training Stage I	1.19 1	1.34 1
Primary Flight Training Stage II	1.29 1	0.91 1
Instrument Flight Training Stage I (Basic)	2.07 2	2.43 3
Instrument Flight Training Stage II (Advanced)	2.32 2	2.89 3

Will It Support Introductory Helicopter Flight Training?

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the simulator, not them, was being evaluated for its utility. Besides their flight task ratings, participants were asked specifically how they would use the micro-simulator for IERW if they were in a decision-making capacity. Also, their spontaneous comments and criticisms while they operated the device were recorded.

The ratings of the Student Aviators were highly, and positively, correlated with those of the Experienced Aviators. That is, there was strong agreement between the instructor sample and the student sample as to which tasks were best supported by the simulator and which were least supported. This strong agreement was also seen in their answers to the open-ended question as well as in their spontaneous comments and criticisms.

Will the simulator support introductory helicopter flight training? Yes and no--it depends upon the task. The table presents the results of the evaluations summarized across the four stages of flight training and the two categories of aviator. Both Experienced and Student Aviators rated the micro-simulator as better able to support Instrument Flight Training than Primary Flight Training. Both groups rated the micro-simulator as best able to support Advanced Instruments. Overall, the micro-simulator was evaluated as "slightly" able to support Primary Flight Training but "moderately" or "well" able to support the Instrument Flight Training stages. This difference in ratings favoring the ability of the micro-simulator to support Instrument tasks over Primary tasks was statistically significant for both aviator samples. Within Primary Training the tasks consistently rated as least well supported were those involving hovering. The median rating given all hovering tasks by both groups was 0 or "Does not support the task at all."

In answer to the open-ended question, 15 of 16 evaluators said that the micro-simulator had value for the Instruments portion of IERW. Six evaluators put a finer point on it, stating that this device was not so much a "flight simulator" as a "procedures trainer" for the Basic and Advanced stages of Instruments.

Rear view showing visual display of commercial micro-simulator

The most frequently stated positive comment spontaneously voiced by participants was that the device had value as an instruments trainer. The three most frequently cited criticisms were the narrow field of view, the poor visual cues to depth, and the inability to hover. These three weaknesses make the simulation of visually referenced flight in a helicopter problematic.

For additional information, please contact ARI-Rotary-Wing Aviation Research Unit, DSN 558-2834 or Commercial (334) 255-2834.

Virtual Environments for Dismounted Soldier Simulation

The U. S. Army Research Institute Simulator Systems (Orlando, FL) and Infantry Forces (Fort Benning, GA) Research Units are leading a four-year joint Science and Technology Objective (STO) with the Army Simulation, Training and Instrumentation Command (STRICOM) and the Army Research Laboratory (ARL). The STO, "Virtual Environments for Dismounted Soldier Simulation, Training, and Mission Rehearsal," was established to develop, and evaluate technologies, techniques, and strategies for using virtual simulations for dismounted soldier, leader, and small unit training, mission rehearsal, concept development, and test and evaluation.

Our goal is to develop capabilities to provide effective training to small unit leaders at the fire team, squad, and platoon level using Virtual Environments (VEs). VEs are computer-generated, three-dimensional worlds in which trainees can be immersed and with which they can interact, usually viewing them through head-mounted displays on large-screen projection systems. Training for small unit leaders in VEs will consist of repeated practice in a virtual world, enhanced by training features, coaching, and After Action Reviews (AARs) to build decision-making and coordination skills. Computer-generated figures controlled by a combination of "intelligent" software and a human operator will represent subordinates, other friendly forces, enemy forces, and civilians. We want to produce a training system that is realistic and effective yet requires a fairly low level of personnel support for subordinates and role players. An earlier progress report on this program, Dismounted Soldier Simulation – Technology Development & Evaluation, was provided in the Winter 2001 Newsletter. This article provides an update on new capabilities that have recently been added and the assessment exercises conducted through September 2001.

"Software that lets a single operator control simulated friendly soldiers, enemy soldiers and civilians."

A new capability developed in 2001 is the Dismounted Infantry Virtual After Action Review System (DIVAARS). DIVAARS is designed to meet two needs. The first is to improve performance by providing soldiers with a common understanding of what happened during an exercise and why it happened. The second need is to facilitate data analysis, in support of training research and development. The key capabilities of DIVAARS are DVD-like replay with synchronized audio and video, including the capability to jump to pre-designated time segments or views, and tabular data summaries. The primary view is a top down bird's eye view display with the capability to view events from any location in the terrain database. Graphics enhancements include graphical tracking of individual and small unit movements, display of individual soldier IDs, and the capability to select and view events on building floors within multi-story buildings. A DIVAARS display is shown in Figure 1.

Dismounted Infantry Semi-Automated Forces (DISAF) is not a new capability, but is continually being improved. DISAF is software that lets a single operator control simulated friendly soldiers, enemy soldiers and civilians. New behaviors developed or under development range from automatic room and building clearing to civilian crowd behaviors. Enhancements are also being made to reduce DISAF operator workload.

Our STRICOM and ARL partners are concurrently developing additional capabilities. These include: leader control of DISAF by voice and gesture; simulation of night conditions with and without the use of night vision devices; representation of streetlights and interior building lights; night tools such as flashlights and aiming

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Virtual Environments for Dismounted Soldier Simulation

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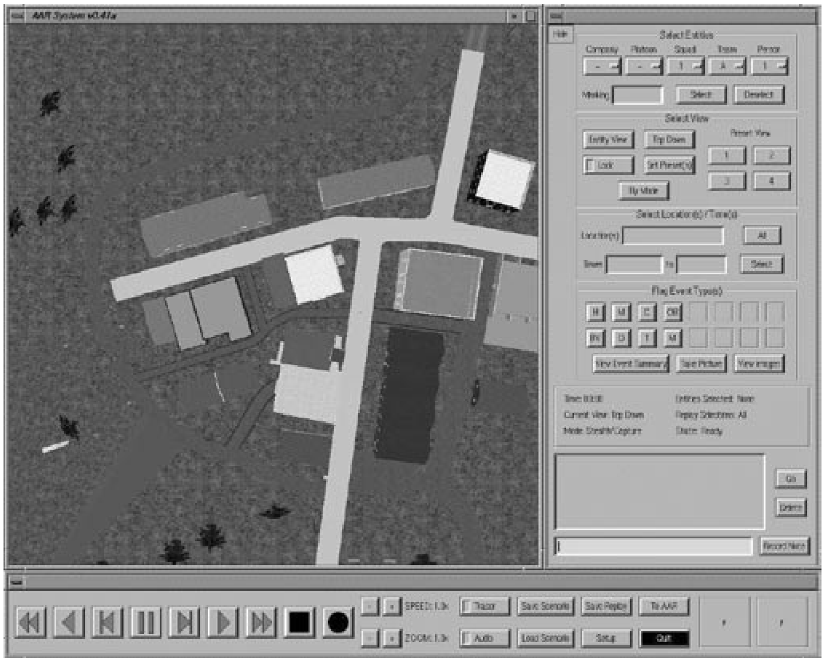

Figure 1. DIVAARS Main Display

lights; and improved methods of locomotion. They are also developing the capability to blow holes in virtual buildings, creating rubble that is appropriately sized for the munitions used and building material hit.

Since the STO began we have evaluated new developments at the end of each year using Infantry soldiers. The latest assessment was held at the Dismounted BattleSpace BattleLab Land Warrior Testbed, Fort Benning, GA during September 2001. It included five days conducting scenarios with Infantry soldiers.

The following items were connected to the network:

- Five Soldier Visualization Station (SVS) individual soldier simulators (Figure 2). These were used by the squad leader, the two fire team leaders, and two of the three Fire Team A members. The simulators were identical, except for additional equipment in the Fire Team B leader's area for the voice recognition system. All SVSs were equipped with simulated radio headsets that permitted verbal communication among the squad members.
- One Omni-Directional Treadmill (ODT) station. ODT is a highly realistic locomotion simulator. Like the SVSs, this station was equipped with a simulated radio headset.
- One Voice Recognition PC.
- One DIVAARS PC.
- One Dynamic Terrain Server.
- One BattleMaster/DISAF Operator Station. The DIS SAF Operator and the Exercise Controller used this station. DISAF were used to represent the B fire team members, enemy soldiers, and civilians.
- One Desktop SVS used by a role player.

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Virtual Environments for Dismounted Soldier Simulation

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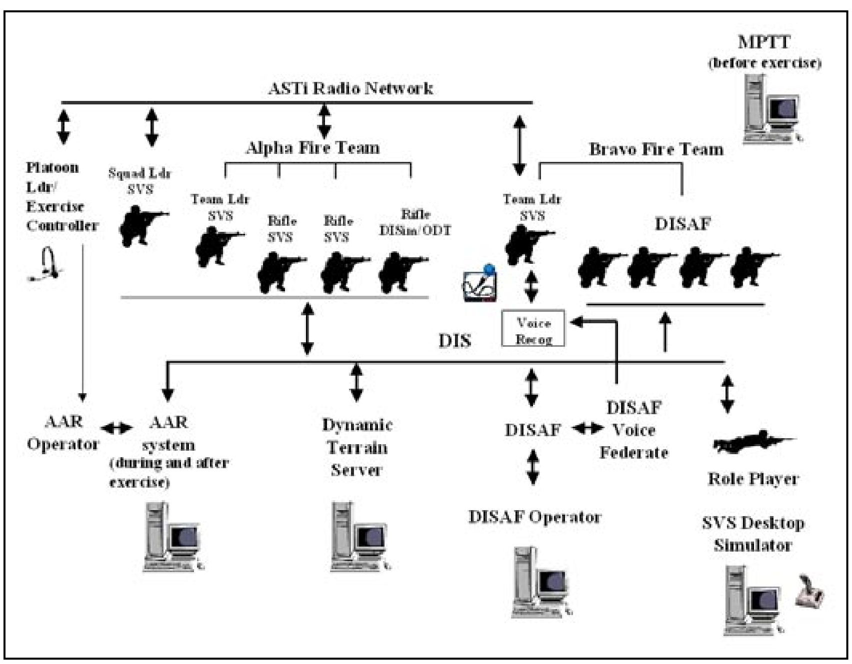
Figure 2. Fire Team B Leader in an SVS.

The network configuration is shown in Figure 3.

A general situation and eight different scenarios were developed. Each of the scenarios was about 20 minutes in duration. They focused specifically on inducing the soldiers to use the various new devices and capabilities in the VE. Seven of the eight scenarios took place in a virtual representation of the Shugart-Gordon MOUT facility at Fort Polk, LA. The eighth scenario took place in a high-rise office building described as being in an adjacent town. The scenarios covered a variety of wartime and support operations. The descriptive scenario titles were: support operations checkpoint, hostage rescue, support by fire, assault and clear a building, roving patrol, air assault and clear a building, crowd control, and downed helicopter. Each exercise began with a mission briefing. A mission planning system, the Mission Planning and Training Tool (MPTT) was used to help plan missions. The soldiers then conducted the mission in the simulators, and participated in an AAR (Figure 4).

Figure 3. Network Configuration for the FY 2001 Culminating Event.



After completion of the exercises, the soldier participants completed questionnaires and engaged in structured group interviews to assess the various VE technologies and potential procedures and strategies for using them. Issues covered varied from very specific aspects of the individual simulators to general questions about the VE simulation of dismounted operations.

Overall, the culminating event was a success. It provided a realistic and challenging test of the systems under development, and they generally performed well, not just as independent systems, but as coordinated components of a larger system. When systems did not work, the causes could usually be identified, and in some cases corrected immediately. Problems that could not be corrected immediately were identified as high priority items for future development.

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Virtual Environments for Dismounted Soldier Simulation

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Figure 4. A post-exercise AAR.

In the absence of objective measures of task performance, the only available indication of learning during the exercises was the self-reports of the Squad and Fire Team Leaders. As shown in Table 1, these were quite positive, with the majority of the leaders reporting improvement on each of the eleven tasks they were asked to rate. These ratings were substantially higher than those obtained in 1999. Training effectiveness, even perceived training effectiveness, is a combination of factors, and reflects not only the simulation technologies, but also other factors such as the scenarios and AAR quality. If these results can be replicated in the future with objective measures of performance, it will establish the effectiveness of the VE as a means for training dismounted Infantry.

The VE STO will conclude this year. During the year, effort will focus on correcting shortcomings and developing the higher-priority enhancements identified in the FY01 Evaluation. Prior to the end of FY 02, a final assessment will be held at Fort Benning.

For additional information, please contact ARI-Simulator Systems Research Unit, DSN 970-3980 or Commercial (407) 384-3980.

Table 1. Leader Ratings of Training Effectiveness

Task	% Indicating improvement as a result of training
Coordinate activities with your chain of command	100%
Assess the tactical situation	93%
Squad/fire team communication and coordination	80%
Control squad or fire team movement during assault	80%
Control squad or fire team movement while not in contact with the enemy	80%
Control your squad or fire team	80%
React to Contact Battle Drill	80%
Plan a tactical operation	73%
Locate known or suspected enemy positions	67%
Clear a building	57%
Clear a room	53%

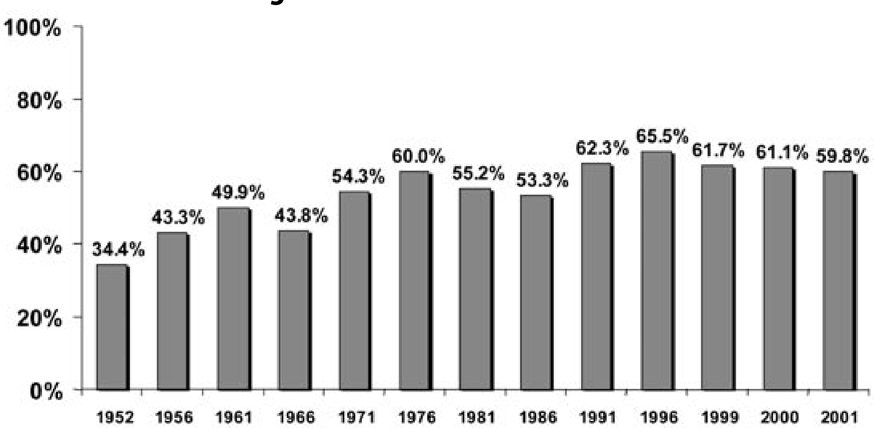
Did you know...

The percent of married soldiers in the Active component of the Army has varied greatly since the early 1950s?

- in the 1990s, the percent of married soldiers (both officers and enlisted personnel) reached a peak of 65.5% in 1996 (including those who reported they were "separated, filing for divorce") – Figure 1
- marital status rates among officers have remained steady since 1986 – Figure 2
- the percent of married enlisted soldiers has declined from 63.2% in 1996 to 56.7% in 2001 (including those "separated, filing for divorce") – Figure 3
- the official marital status rates data are maintained by the Defense Enrollment Eligibility Reporting Systems (DEERS)

Marital Status
1952-2001

Figure 1: All Married Soldiers[1]



[1]Includes those who are separated, filing for divorce.

S.E. +/-1

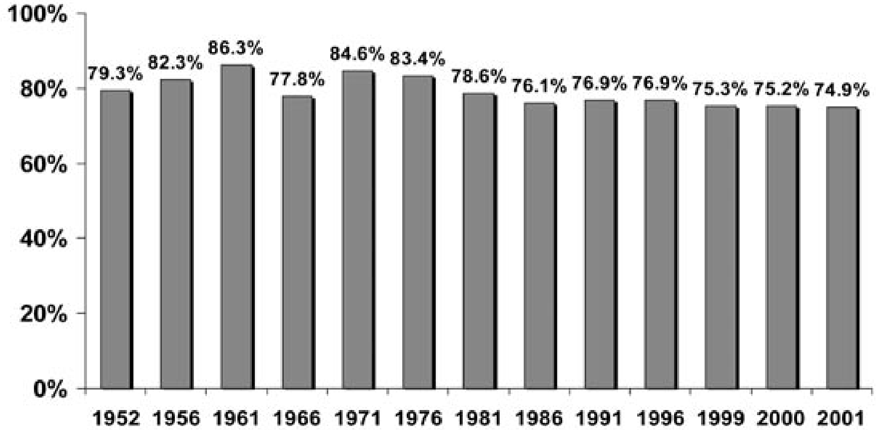
Note: 1996-2001: PV1s are not targeted for inclusion in the SSMP. PV2s in USAREUR (Europe) and Eighth US Army (Korea) are not included.

Army Personnel Survey Office,
U.S. Army Research Institute

Sample Survey of Military Personnel

Marital Status
1952-2001

Figure 2: Married Officers[1]



[1]Includes those who are separated, filing for divorce.

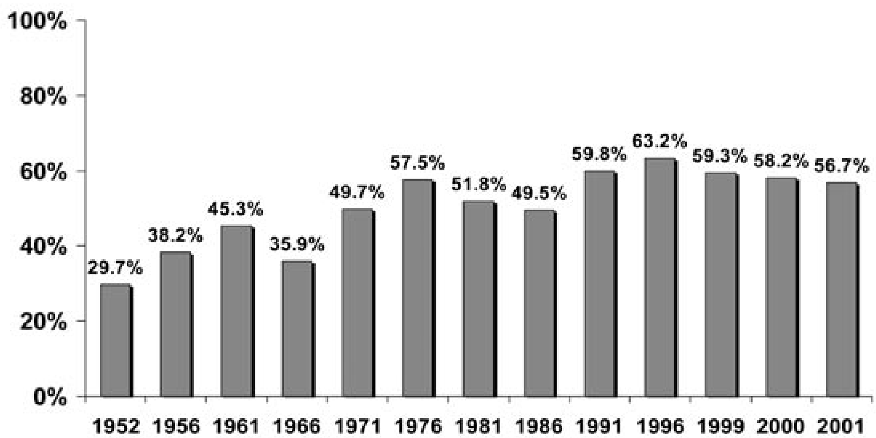
S.E. +/-2

Army Personnel Survey Office,
U.S. Army Research Institute

Sample Survey of Military Personnel

Marital Status
1952-2001

Figure 3: Married Enlisted Personnel[1]



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S.E. +/-1

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